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Docket No. 0756-1998

#34
5/20/03
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of) Art Unit: 2823
Shunpei YAMAZAKI et al.) Examiner: Fernando L. Toledo
Serial No. 09/352,194 ✓)
Filed: July 13, 1999 ✓)
For: CRYSTALLINE)
SEMICONDUCTORTHIN FILM,)
METHOD OF FABRICATING THE)
SAME, SEMICONDUCTOR DEVICE,)
AND METHOD OF FABRICATING THE)
SAME)

CERTIFICATE OF MAILING

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Adeline M. Stampen

REQUEST FOR RECONSIDERATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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Sir:

The Official Action mailed January 10, 2003, has been received and its contents carefully noted. Filed concurrently herewith is a *Request for One Month Extension of Time*, which extends the shortened statutory period for response to May 10, 2003. Accordingly, the Applicants respectfully submit that this response is being timely filed.

The Applicants note with appreciation the consideration of the Information Disclosure Statements filed on October 12, 1999; May 24, 2000; September 1, 2000; November 30, 2000; January 29, 2001; April 4, 2001; August 22, 2001; April 10, 2002; May 22, 2002; and July 6, 2002. The Applicants await consideration of the Information Disclosure Statement filed January 3, 2003.

Claims 5 and 36-60 are now pending in the present application, of which claims 5, 36-48, 55 and 56 are independent. For the reasons set forth in detail below, all claims are believed to be in condition for allowance.

The Official Action asserts that claims 5 and 36-60 conflict with claims 1-18 of U.S. Application No. 09/894,125. The Applicants respectfully disagree. As conceded in

the Official Action, "the copending Application No. 09/894,125 does not recite the limitation 'providing the semiconductor film with a catalytic element for facilitating a crystallization of the semiconductor film.'" (p. 2, Paper No. 31). Therefore, the claims of the present invention do not conflict with the '125 application. Accordingly, the Applicants request that the objection be reconsidered and withdrawn.

The Official Action provisionally rejects claims 5 and 36-60 under the doctrine of obviousness-type double patenting over the combination of claims 1-18 of the '125 application and U.S. Patent No. 5,616,506 to Takemura. The Applicants respectfully request that the double patenting rejections be held in abeyance until an indication of allowance is made in either the present application or the copending application.

The Official Action rejects claims 5, 36-48, 55 and 56 as obvious based on the combination of Takemura, U.S. Patent No. 5,569,610 to Zhang et al., and U.S. Patent No. 6,071,796 to Voutsas. The Applicants respectfully traverse the rejection because the Official Action has not made a *prima facie* case of obviousness.

As stated in MPEP §§ 2143-2143.01, to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

Independent claims 5 and 36-48 of the present invention recite removing an oxide film from a surface of a semiconductor film by etching after irradiating the semiconductor film with a laser light (claims 5, 36-40 and 47) or treating a surface of the semiconductor film with a hydrofluoric acid after irradiating the semiconductor film with a laser light (claims 41-46 and 48), leveling the surface of the semiconductor film by heating after removing the oxide film (claims 5, 36-40 and 47) or after the hydrofluoric acid treatment (claims 41-46 and 48), and etching the semiconductor film into a semiconductor layer after the leveling step (claims 5 and 36-48; p. 16, lines 11-29, and Figs. 1C and 2A). In other words, the leveling step is performed after the removing/treating step and before the etching step.

The prior art, either alone or in combination, does not teach or suggest all the features of the independent claims. The Examiner asserts that Takemura teaches removing an oxide film 304 from a surface of the semiconductor film, leveling the surface of the semiconductor film by heating after removing the oxide film, and etching the semiconductor film into a semiconductor layer after the leveling step (p. 3, Paper No. 31, citing Takemura at col. 10 and Figs. 7A-7F). However, the prior art does not support these assertions.

It appears that Takemura teaches annealing the substrate 301 (col. 10, lines 29-31), crystallizing the silicon film 303 (col. 10, lines 42-49, Fig. 7B), etching the silicon film 303 into island-like active layer regions 310 and 311 (col. 10, lines 50-54, Fig. 7C), and oxidizing to form silicon oxide layers (col. 10, lines 55-67). However, Takemura does not teach removing the oxide film, a leveling step or a hydrofluoric acid treatment step. Also, it is not clear from the Official Action or Takemura itself which step of Takemura is supposed to correspond with the leveling step of the present invention, much less the sequencing of such a step.

With respect to claims 5, 36-40 and 47, for the sake of argument, even if it can be shown that the oxide film 304 is removed in a process between Fig. 7B and Fig. 7C, and that either the annealing step (col. 10, lines 29-31) or the oxidizing step (col. 10, lines 55-67) of Takemura is equivalent to the leveling step of the present invention, Takemura does not teach or suggest leveling the semiconductor film by heating after removing the oxide film and before etching the semiconductor film into a semiconductor

layer. In other words, Takemura does not teach or suggest moving either the annealing step or the oxidizing step between the crystallization step and the etching step. Therefore, Takemura fails to teach the leveling step before the etching step as recited in the claims of the present invention.

Similarly, with respect to claims 41-46 and 48, the prior art does not teach or suggest treating a surface of the semiconductor film with a hydrofluoric acid after irradiating the semiconductor film with a laser light, leveling the surface of the semiconductor film by heating after the hydrofluoric acid treatment, and etching the semiconductor film into a semiconductor layer after the leveling step (see also the discussion of Ohtani below).

Zhang '610 and Voutsas do not cure the deficiencies in Takemura. The Official Action relies on Zhang '610 to teach irradiating the semiconductor film with a laser light for crystallizing the semiconductor film providing the catalytic element (pp. 3-4, Paper No. 31) and on Voutsas to teach crystallization in air (p. 4, Id.). Takemura, Zhang '610 and Voutsas, either alone or in combination, do not teach or suggest at least performing a leveling step before an etching step.

Furthermore, independent claims 55 and 56 recite removing a natural oxidation film from a surface of the semiconductor film (p. 7, last line, to p. 8, line 3). It appears that the Official Action fails to address the natural oxide film in the Office Action. Although the Official Action asserts that Takemura discloses removing an oxide film 304 from a surface of the semiconductor film, it should be noted that the oxide film 304 is not a natural oxidation film but a mask. Further, it appears that neither Zhang '610 nor Voutsas teaches the natural oxide film. The Applicants respectfully submit that Takemura, Zhang '610 and Voutsas, either alone or in combination, do not teach or suggest removing a natural oxidation film from a surface of a semiconductor film.

Since Takemura, Zhang '610 and Voutsas do not teach or suggest all the claim limitations, a *prima facie* case of obviousness cannot be maintained. Accordingly, reconsideration and withdrawal of the rejection under 35 U.S.C. § 103(a) is in order and respectfully requested.


The Official Action rejects claims 37-40, 43, 44, 46-48, 55 and 56 as obvious based on the combination of Takemura, Zhang '610, and U.S. Patent No. 5,888,857 to

Zhang. Zhang '857 does not cure the deficiencies in Takemura and Zhang '610. The Official Action relies on Zhang '857 to teach heating in an inert gas (p. 5, Paper No. 31). The prior art, either alone or in combination, do not teach or suggest that the leveling step occurs before the etching step as recited in claims 37-40, 43, 44, and 46-48, and removing the natural oxidation film as recited in claims 55 and 56. Since Takemura, Zhang '610 and Zhang '857 do not teach or suggest all the claim limitations, a *prima facie* case of obviousness cannot be maintained. Accordingly, reconsideration and withdrawal of the rejection under 35 U.S.C. § 103(a) is in order and respectfully requested.

The Official Action rejects claims 41-45 as obvious based on the combination of Takemura, Zhang '610, Zhang '857, and U.S. Patent No. 6,285,042 to Ohtani et al. Ohtani does not cure the deficiencies in Takemura, Zhang '610 and Zhang '857. The Official Action relies on Ohtani to teach using hydrofluoric acid to etch away the silicon oxide layer (p. 6, *Id.*). However, the prior art, either alone or in combination, do not teach or suggest treating a surface of the semiconductor film with a hydrofluoric acid after irradiating the semiconductor film with a laser light, leveling the surface of the semiconductor film by heating after the hydrofluoric acid treatment, and etching the semiconductor film into a semiconductor layer after the leveling step. Even if Ohtani teaches removing Takemura's silicon oxide layer with hydrofluoric acid, nothing in the prior art teaches or suggests why a skilled artisan would be motivated to perform a leveling step between the crystallization step and the etching step of Takemura. Since Takemura, Zhang '610, Zhang '857 and Ohtani do not teach or suggest all the claim limitations, a *prima facie* case of obviousness cannot be maintained. Accordingly, reconsideration and withdrawal of the rejection under 35 U.S.C. § 103(a) is in order and respectfully requested.

Should the Examiner believe that anything further would be desirable to place this application in better condition for allowance, the Examiner is invited to contact the Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,



Eric J. Robinson
Reg. No. 38,285

Robinson Intellectual Property Law Office, P.C.
PMB 955
21010 Southbank Street
Potomac Falls, Virginia 20165
(571) 434-6789